Absolute-pressure sensors in micromechanical hybrid design

Measurement of pressures in gases up to 400 kPa

p/U

- High accuracy.
- EMC protection better than 100 V m^{-1}.
- Temperature-compensated.
- Version with additional integral temperature sensor.

Applications
This sensor is used to measure the absolute intake-manifold pressure. On the version with integral temperature sensor, the temperature of the drawn-in air flow is also measured.

Design and function
The piezoresistive pressure-sensor element and suitable electronic circuitry for signal-amplification and temperature compensation are mounted on a silicon chip. The measured pressure is applied from above to the diaphragm's active surface. A reference vacuum is enclosed between the rear side and the glass base. Thanks to a special coating, both pressure sensor and temperature sensor are insensitive to the gases and liquids which are present in the intake manifold.

Installation information
The sensor is designed for mounting on a horizontal surface of the vehicle's intake manifold. The pressure fitting together with the temperature sensor extend into the manifold and are sealed-off to atmosphere by O-rings. By correct mounting in the vehicle (pressure-monitoring point on the top at the intake manifold, pressure fitting pointing downwards etc.) it is to be ensured that condensate does not collect in the pressure cell.

Range

Pressure range kPa (p_1...p_2)	Characteristic curve[1])	Features	Dimension drawing[2])	Order No.
10...115	1		1	**B 261 260 136**[3])
10...115	1		2	**0 261 230 052**
20...250	1		1	**0 281 002 487**
10...115	1	Integral temperature sensor	3	**0 261 230 030**
20...250	1	Integral temperature sensor	3	**0 261 230 042**
20...300	1	Integral temperature sensor	3	**0 281 002 437**
50...350	2	Integral temperature sensor	3	**0 281 002 456**
50...400	2	Integral temperature sensor	3	**B 261 260 508**[3])

[1]) The characteristic-curve tolerance and the tolerance expansion factor apply for all versions, see Page 36
[2]) See Page 37
[3]) Provisional draft number, order number available upon enquiry. Available as from about the end of 2001

Accessories

Plug housing	Qty. required: 1[4])	**1 928 403 966**
Plug housing	Qty. required: 1[5])	**1 928 403 736**
Contact pin	Qty. required: 3 or 4[6])	**1 928 498 060**
Individual gasket	Qty. required: 3 or 4[6])	**1 928 300 599**

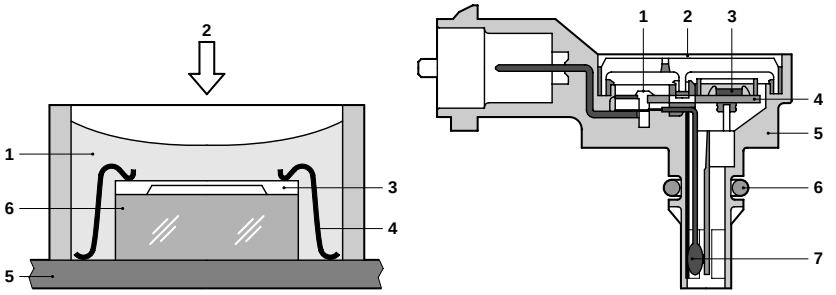
[4]) Plug housing for sensors without integral temperature sensor
[5]) Plug housing for sensors with integral temperature sensor
[6]) Sensors without temperature sensor each need 3 contacts and gaskets. Sensors with integral temperature sensor each need 4 contacts and gaskets

Technical data

			min.	typ.	max.
Operating temperature	ϑ_B	°C	–40	–	+130
Supply voltage	U_V	V	4.5	5.0	5.5
Current consumption at U_V = 5 V	I_V	mA	6.0	9.0	12.5
Load current at output	I_L	mA	–1.0	–	0.5
Load resistance to U_V or ground	$R_{pull\text{-}up}$	kΩ	5	680	–
	$R_{pull\text{-}down}$	kΩ	10.0	100	–
Response time	$t_{10/90}$	ms	–	1.0	–
Voltage limitation at U_V = 5 V					
Lower limit	$U_{A\,min}$	V	0.25	0.3	0.35
Upper limit	$U_{A\,max}$	V	4.75	4.8	4.85
Limit data					
Supply voltage	$U_{V\,max}$	V	–	–	+16
Storage temperature	ϑ_L	°C	–40	–	+130
Temperature sensor					
Measuring range	ϑ_M	°C	–40	–	+130
Measured current	I_M	mA	–	–	1[1]
Nominal resistance at +20 °C		kΩ	–	2.5±5%	–
Thermal time constant	t_{63}	s	–	–	10[2]

[1]) Operation at 5 V with 1 kΩ series resistor
[2]) In air with a flow rate of 6 m · s^{-1}

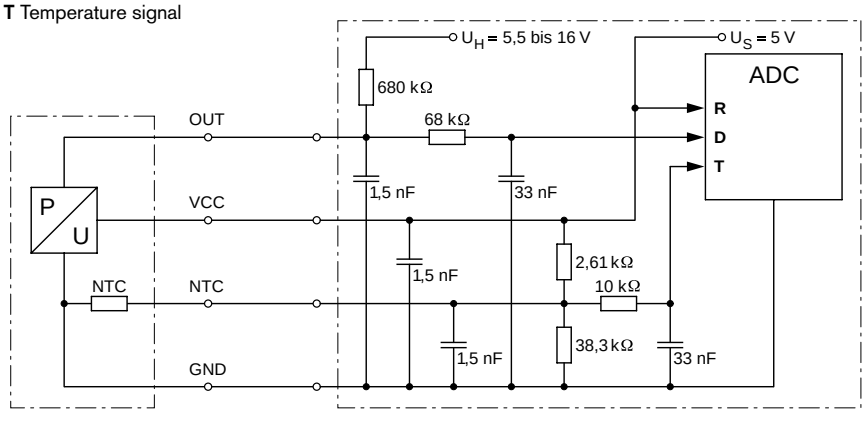
Sectional view.
Section through the sensor cell **Section through the DS-S2 pressure sensor**



Section through the sensor cell.
1 Protective gel, **2** Pressure, **3** Sensor chip, **4** Bonded connection, **5** Ceramic substrate, **6** Glass base.

Section through the pressure sensor.
1 Bonded connection, **2** Cover, **3** Sensor chip, **4** Ceramic substrate, **5** Housing with pressure-sensor fitting, **6** Gasket, **7** NTC element.

Signal evaluation: Recommendation.
R Reference
D Pressure signal
T Temperature signal



Pressure sensor **ECU**

Signal evaluation: Recommendation.
The pressure sensor's electrical output is so designed that malfunctions caused by cable open-circuits or short circuits can be detected by a suitable circuit in the following electronic circuitry. The diagnosis areas situated outside the characteristic-curve limits are provided for fault diagnosis. The circuit diagram shows an example for detection of all malfunctions via signal outside the characteristic-curve limitation.

Absolute-pressure sensors in micromechanical hybrid design (contd.)
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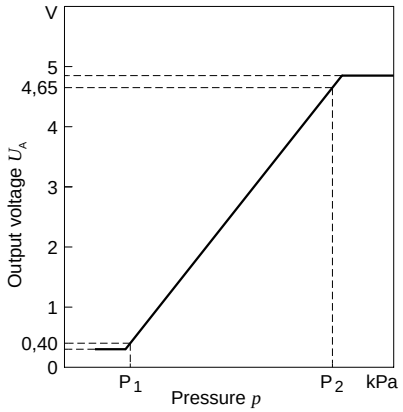
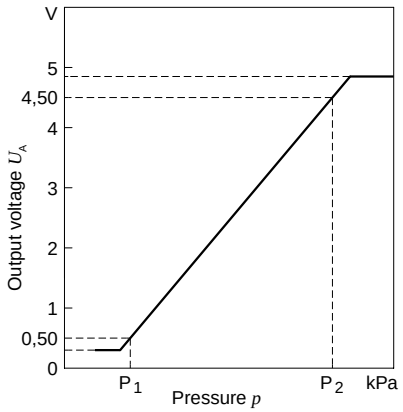
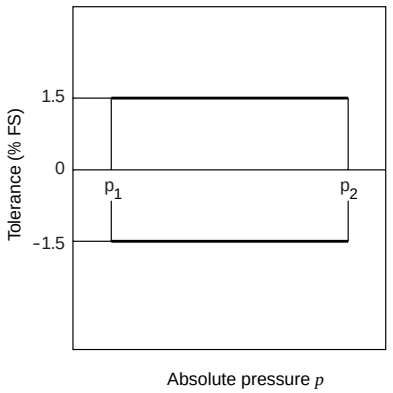
Characteristic curve 1 (U_V = 5.0 V).



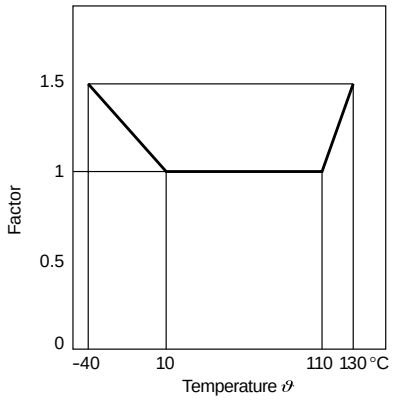
Characteristic curve (U_V = 5.0 V).



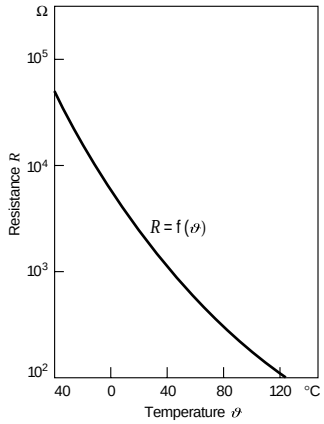
Characteristic-curve tolerance.



Tolerance-expansion factor.



Temperature-sensor characteristic curve.



Explanation of symbols.

U_A Output voltage
U_V Supply voltage
k Tolerance multiplier
D After continuous operation
N As-new state

Dimensions drawings.

① Connector-pin assignment
Pin 1 +5 V
Pin 2 Ground
Pin 3 Output signal

② Connector-pin assignment
Pin 1 +5 V
Pin 2 Ground
Pin 3 Output signal

③ Connector-pin assignment
Pin 1 Ground
Pin 2 NTC resistor
Pin 3 +5 V
Pin 4 Output signal